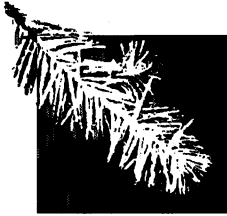


Appendix 5 - Economic Information



Appendix 5. Economic Information

Harvest Projections and Economic Analysis

Appendix 5 provides background information regarding the process used by DNR in formulating harvest projections and conducting economic analysis of the proposed HCP. Results of this analysis formed the basis for the economic analysis conducted by the Service and included in the DEIS and modified in this FEIS. Material in this appendix is from two sources. First, text from a "Fact Sheet" prepared in May 1996 by DNR is reproduced for reference. Second, pages 30 through 36 from a report, *Background and Analytical Framework for the Proposed Draft Habitat Conservation Plan*, prepared by DNR for the Board of Natural Resources in October 1996 is included.

Economic Analysis Procedure for DNR's Habitat Conservation Plan

A habitat conservation plan (HCP) is a long-term land management plan authorized under the Endangered Species Act to conserve threatened and endangered species. For the Washington Department of Natural Resources (DNR), it means a comprehensive plan for state trust lands within the range of the northern spotted owl, that will allow timber harvesting and other management activities while emphasizing species conservation and ecosystem health as the basis for prudent trust management.

Overview of Analysis

DNR developed a sustainable harvest simulation program that was used in western Washington to forecast timber production capacity for each option of the proposed HCP conservation strategies. Simulations were designed to produce a "nondeclining even-flow" of timber. That is, timber is produced at a constant level until timber stocking levels allow an increase in harvest volume that can be sustained without a decline in the future.

The simulation looked at least 200 years into the future, time enough to assure that simulated harvests were unlikely to deplete the timber inventory to such an extent that timber production would have to be reduced in the future. Management activities and timber growth were simulated for 10-year periods.

Although the process aimed at calculating a sustainable level of timber harvest, it was not a sustainable harvest calculation as specified in the Forest Resource Plan, which sets forth DNR's current policies for managing forest resources. The Forest Resource Plan calls for

separate sustainable harvest calculations for each of several groups of trust land. However, with the number of HCP options that had to be analyzed, there would have been an inordinate number of simulator runs needed to calculate results under the Forest Resource Plan specification. Instead, the harvest simulation was run for each option in each HCP planning unit.

This approach to timber harvest calculation provided a satisfactory basis for comparing HCP alternatives in western Washington, even though the numbers would not be exactly the same as those produced by the calculation for the Forest Resource Plan.

Eastern Washington forest inventory data currently available did not support a sustainable harvest simulation. Instead, the eastern Washington analysis started with the sustainable harvest volume determined before protection of spotted owl habitat affected the amount of timber available. That volume was adjusted by estimating the proportion of land on which spotted owl habitat would be protected and the proportional impact on timber yields of protecting habitat.

In order to project sales revenues for DNR-managed trust lands covered by the HCP, the projected flow of timber over 200 years into the future in both western and eastern Washington was then analyzed by determining present net worth. Present net worth is calculated by valuing, in terms of current dollars, all future income minus all future costs.

Sustainable harvest simulator

The sustainable harvest simulator started with current forest inventory data as recorded in DNR's geographic information system. The simulator then made adjustments for planned silvicultural practices, including timber harvest, over the first 10 years and "grew" the inventory for 10 years.

The result of the first 10-year simulation formed the beginning inventory for the next 10-year period. The cycle was repeated for succeeding 10-year periods. If, at any time, the inventory showed that it would not support the simulated volume of timber harvest, the amount of harvest was reduced and the process was repeated. If, at the end of the simulation, an excessive amount of inventory was indicated, the harvest level was adjusted upward and the process was repeated. The condition of the inventory was judged by the amount of timber at harvest age or older.

When an acceptable level of ending inventory was achieved without the harvest volume declining between 10-year periods, the simulation was complete. The harvest volumes shown for each period are the amounts that the land is capable of producing.

Growth models

The sustainable harvest simulator used growth models to "grow" the forest for each 10-year period. In western Washington the simulator used:

- For Douglas fir — DFSIM, a widely used Douglas fir growth model developed by Robert Curtis of the Olympia Forest Sciences Laboratory, USDA Forest Service

■ For western hemlock — the Forestry Canada western hemlock growth model developed by James Flewelling

■ For red alder — DNR empirical yield functions developed by Charles Chambers

Outside review of DNR's analysis

DNR's methods for deriving the projected harvest levels and sales revenues were reviewed by an outside independent expert in resource economics and environmental analysis, who found the assumptions and methodology to be appropriate. A sensitivity analysis was subsequently done by the outside resource economist to provide additional information for the Board of Natural Resources, the policy-making body that will ultimately decide whether to adopt the HCP. In addition, a consulting firm performed a decision analysis that looked at the likely occurrence of future regulatory constraints that would govern DNR forest land management.

Harvest Volume and Financial Analysis

Introduction

DNR uses present net worth (PNW) analysis to demonstrate the economic value of the No Action and the HCP options. Economic analyses commonly use PNW as a tool in evaluating which alternative to select as financially preferable. PNW is calculated by valuing, in terms of 1995 dollars, all future income minus all future costs.

The calculation of Present Net Worth involves several steps. The land base within the boundaries of the northern spotted owl range is identified. Non-forest lands are excluded from the analysis as are off-base forest lands, such as genetic reserves, Natural Area Preserves and Natural Resource Conservation Areas.

The data within the starting land base include information about the age class of the trees, current and projected volume per acre by site class, expected management regime, the proximity to recently harvested lands, roads, streams, slope, unique habitat or landscape features, etc. These items reflect legal, regulatory and operational constraints on contemporary land managers. These data are further categorized by trust and region.

After establishing the starting land base, the No Action and the HCP options can be evaluated. The No Action option includes adjustments based on riparian management, limitations due to managing for the northern spotted owl, i.e. owl circles, the marbled murrelet, and other factors reflecting the full implementation of the 1992 Forest Resources Plan. For the HCP option a similar process is followed using alternative assumptions regarding riparian buffer widths, unstable slope constraints, protection for special habitat areas, harvesting constraints within designated nesting, roosting, foraging habitat and dispersal habitat, etc.

Once the data for each alternative are incorporated into the computer, a simulation can be performed to calculate the expected harvest for each trust and in total. The output comes in the form of estimated harvest level by decade over the next 20 decades.

Assumptions

Table 3 summarizes the assumptions used in determining the PNW and the estimated harvests, including management assumptions used on the OESF. The OESF is described to demonstrate the differences in management measures, which differ from the other lands due to the emphasis in the OESF on experimentation.

The model used to calculate future harvests uses existing policy; harvests are calculated for ten year time periods with the model seeking the highest harvest allowable without declining from one decade to another. In order to determine the value, during the harvest calculations the cost and timing of the management activities are projected. Based on knowledge of current costs and stumpage prices and assumptions of increase in future cost and prices, the present net value of the harvest is determined. (In the analysis costs and prices increased at 1% per year above inflation. A discount rate of 5% was used to calculate the present value of future costs and revenues.)

**Table 1: Draft Habitat Conservation Plan Assumptions
Riparian Strategy**

| No Action | HCP Option | OESF No Change | OESF Option |
|--|--|--|--|
| Unstable Slopes | | | |
| No timber harvest on areas identified by geomorphological model as “most susceptible to mass wasting”. | No timber harvest on areas identified by geomorphological model as “most susceptible to mass wasting”. | No timber harvest on areas identified by geomorphological model as “most susceptible to mass wasting”. | No timber harvest on areas identified by geomorphological model as “most susceptible to mass wasting”. |
| Upgraded Type 4 Streams | | | |
| Assume that the 45% of Type 4 streams will be upgraded to Type 3. | Assume that the 45% of Type 4 streams will be upgraded to Type 3. | Not applicable. | Not applicable. |
| Unclassified (Type 9) Streams | | | |
| Untyped (Type 9) stream reaches between typed stream reaches are of the same type as the downstream reach. | Untyped (Type 9) stream reaches between typed stream reaches are of the same type as the downstream reach. | Untyped (Type 9) stream reaches between typed stream reaches are of the same type as the downstream reach. | Untyped (Type 9) stream reaches between typed stream reaches are of the same type as the downstream reach. |
| All other untyped (Type 9) streams are Type 5. | All other untyped (Type 9) streams are Type 5. | All other untyped (Type 9) streams are Type 5. | All other untyped (Type 9) streams are Type 5. |

| No Action | | HCP Option | | | OESF No Change | | OESF Option | | | | |
|---|---------------------|--|---------------------|---|--|---------------------|---|----------------------|---------------------|--------|-----|
| RIPARIAN PROTECTED AREA Width of Riparian Protected Area | | | | | | | | | | | |
| Water Type | Width (Feet) | Width (feet) Water Stream Wind Type Buffer Buffer | | | Water Type | Wind (feet) | Width (feet) Water Int. Ext. Type Core Buffer | | | | |
| | 1 | 196 | 1 | 150 | | | 100 | 1 | 150 | 150 | |
| | 2 | 196 | 2 | 150 | | | 100 | 2 | 150 | 150 | |
| | 3 | 85 | 3 | 150 | | | 50 | 3 | 150 | 150 | |
| | 4 | 55 | 4 | 100 | | | 0 | 4 | 100 | 50 | |
| | 5 | 0 | 5 | 0 | | | 0 | 5 | 100 | 50 | |
| | | | | *80% of Type 1 and 2 streams, and 40% of Type 3 streams need wind buffers | | | | | | | |
| Timber Harvest in Riparian Protected Area | | | | | | | | | | | |
| No timber removed or timber management activity. | | 7% of conifer and 18% of alder will be harvested from riparian buffers and wind buffers at each entry. | | | No timber removed or timber management activity. | | No timber harvest in the interior core 30% partial timber harvest in external buffers. | | | | |
| WETLANDS Width of Wetland Buffers | | | | | | | | | | | |
| Wetland Size (acres) | Buffer Width (feet) | Wetland Size (acres) | Buffer Width (feet) | | Wetland Size (acres) | Buffer Width (feet) | | Wetland Size (acres) | Buffer Width (feet) | | |
| | 0.25-1 | | 100 | 0.25-1 | | 100 | 0.25-1 | | 100 | 0.25-1 | 100 |
| | >1 | | 150 | >1 | | 150 | >1 | | 150 | >1 | 150 |
| Timber Harvest in Wetlands and Wetland Buffers | | | | | | | | | | | |
| Remove 40% of volume at each entry | | Remove 40% of volume at each entry | | | Remove 40% of volume at each entry | | Remove 40% of volume at each entry | | | | |

| No Action | HCP Option | OESF No Change | OESF Option |
|---|---|---|--------------------------------------|
| HYDROLOGIC MATURITY/RAIN ON SNOW | | | |
| Harvest calculations need not be concerned with hydrologic maturity | Hydrologic maturity can be attained on at least 2/3 of DNR-managed lands within the rain on snow zone in 1000 acre basins when following current silvicultural practices of timber harvest is delayed until age 75 years. | Harvest calculations need not be concerned with hydrologic maturity | No provision for hydrologic maturity |

Assumptions for Riparian Strategy

ALL OPTIONS

Assume that requirements for wildlife reserve trees, including additional trees provided under DNR policy, are met as follows:

- Associated with riparian areas and wetlands - No reduction factor for yields is required.
- Not associated with riparian areas and wetlands - Reduce yields by 5%.

MARBLED MURRELET HABITAT

NO ACTION

There would be no timber harvest on 2/3 of the stands with the following characteristics:

- Within 52 miles of salt water; and,
- At least eight conifer trees per acre which are at least 32 inches DBH.

HCP OPTION

There would be no timber harvest on 1/3 of the stands with the following characteristics:

- Within 50 miles of salt water; and,
- At least eight conifer trees per acre which are at least 32 inches DBH.

Table 2: Draft Habitat Conservation Plan Assumptions for Spotted Owl Strategy

| NO ACTION | HCP OPTION | OESF ALTERNATIVE |
|--|--|---|
| <p>NUMBER OF OWL CIRCLES - An additional 46 spotted owls not yet located will be located on state land.</p> <p>ADDITIONAL HABITAT FOR OWLS IN CIRCLES WITH LESS THAN 40% HABITAT - All the non-habitat forest land located in a circle that is below 40% requirement for habitat will be managed so that no additional forest land will become habitat.</p> <p>OWL CIRCLES INCLUDING DNR AND PRIVATE OWNERSHIP - When a circle is located on both DNR and private land, the private landowner will have removed all habitat, leaving DNR trust land to supply 100% of the required habitat in the circle.</p> | <p>Entire HCP Area</p> <p>No timber harvest from NRF habitat devoted to providing the target amount.</p> <p>Area selected to provide target amount of NRF for a watershed administrative unit can move around within the WAU.</p> <p>Western Washington</p> <p>300-acre nesting areas are off base permanently.</p> <p>No new nesting habitat will be created.</p> <p>The 200-acre buffers will have the same impact on timber harvest as 200 acres of NRF habitat in addition to the target amount.</p> <p>HABITAT DEFINITIONS</p> <p>High quality nesting habitat is currently unattainable.</p> <p>The snag requirement is the limiting factor in providing sub-mature habitat.</p> <p>Sub-mature habitat can be achieved at age 70.</p> | <p>Definitions:</p> <p>Old forest - At least 100 years old.</p> <p>Spotted Owl Habitat - At least 70 years old, including old forest.</p> <p>Transition Period - The transition period lasts until stands on at least 40% of the state forest land in each landscape planning unit are at least 70 years old. Stands which are off base for riparian areas and marbled murrelet habitat count towards the 40% threshold. During the transition period the forest will be managed to meet the following standards:</p> <p>Maintain 20% of each landscape planning unit in old forest.</p> <p>Stands initially 31 to 99 years old are subject to final harvest when they reach harvest age.</p> |

| NO ACTION | HCP OPTION | OESF ALTERNATIVE |
|--|--|--|
| <p>(continued)</p> <p>OWL CIRCLES INCLUDING DNR AND FEDERAL OWNERSHIP - When a circle is located on both DNR and federal land, the DNR land will supply required habitat only when the federal land doesn't supply the habitat.</p> <p>OWL CIRCLES OVERLAP ON DNR LANDS - When 2 or more circles overlap, habitat enclosed by both circles will be counted as part of each circle's 40%.</p> | <p>(continued)</p> <p>20% of merchantable volume will be left on the ground at each commercial thinning operation and 25% at each regeneration harvest to meet the down wood requirement for sub-mature habitat.</p> <p>The tree size requirement is the limiting condition for dispersal habitat.</p> <p>The size requirement for dispersal habitat can be achieved at age 40.</p> <p>10% of merchantable volume will be left on the ground at each commercial thinning and 5% at each regeneration harvest to meet the down wood requirement for dispersal habitat.</p> <p>Eastern Washington</p> <p>Timber harvest for risk reduction will not affect sustainable harvest levels.</p> <p>Salvage logging will not affect sustainable harvest levels.</p> | <p>(continued)</p> <p>Commercial thinnings may be taken in these stands which are age 30 or younger at the time the plan is adopted. Final harvest may be taken in those stands as long as it does not delay reaching the 40% spotted owl habitat threshold or the 20% old forest threshold.</p> <p>After Transition - When stands on at least 40% of the state forest land in each landscape planning unit are at least 70 years old:</p> <p>Maintain in each landscape planning unit a minimum of 20% in old forest and 40% in spotted owl habitat.</p> <p>Stands off base for riparian areas and marbled murrelet habitat count toward the 20% and 40% thresholds.</p> |

